Dawn H. Gouge & Jennifer L. Snyder
University of Arizona

Parasitism of the bark scorpion *Centruroides exilicauda* (Scorpiones: Buthidae) by entomopathogenic nematodes (Rhabditida: Steinernematidae; Heterorhabditidae)

ABSTRACT In laboratory bioassays *Steinernema glaseri*, *S. riobrave*, *Heterorhabditis bacteriophora*, and *H. marelatus*, were capable of infecting and killing *Centruroides exilicauda*. *Steinernema feltiae* and *S. carpocapsae* failed to infect *C. exilicauda* at 22°C. *Steinernema glaseri*, *H. marelatus* and *H. bacteriophora* caused significant mortality at 22°C, indicating the potential role of these parasitoids as a biocontrol option. Efficacy of *S. glaseri* and *H. bacteriophora* was reduced in an assay conducted at 25°C. Only *S. glaseri* was able to reproduce in the target host. Dissection of scorpions at the end of the experimental periods revealed inactive juvenile *S. riobrave*, *H. marelatus* and *H. bacteriophora* nematodes.

Bark scorpions were exposed to different entomopathogenic nematode species

- Nematodes tested:
  - *Steinernema glaseri*
  - *S. riobrave*
  - *S. feltiae*
  - *S. carpocapsae*
  - *Heterorhabditis bacteriophora*
  - *H. marelatus*

The scorpions responded to the presence of nematodes

Frantic grooming

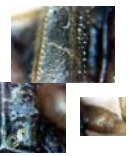
- Bark scorpion responses included:
  - Frantic grooming
  - Standing off substrate
  - Substrate stinging
  - High walking
  - Erratic leg movement

- *S. glaseri*, *S. riobrave*, *H. bacteriophora*, and *H. marelatus* are pathogenic to *C. exilicauda*.

Standing high off the substrate

Stinging substrate

- Only *S. glaseri* was able to reproduce in *C. exilicauda*. Both mermithid and oxyurid nematodes have been documented as nematode parasites of scorpions, but rhabditids have not been reported until now. Field based studies are warranted to assess the usefulness of entomopathogenic nematodes as biocontrol agents of bark scorpions.



Nematodes observed through the cuticle

- *S. feltiae* and *S. carpocapsae* caused no mortality and did not infect the bark scorpions

- Mortality:
  - *H. marelatus* caused 100% mortality at all dose rates tested after 90 hours of incubation at 25°C.
  - Greater than 80% mortality occurred in scorpion replicates dosed with *S. glaseri*, *H. marelatus*, and *H. bacteriophora*, after 296 hours of incubation at 25°C.

- Most nematodes were found in the prosoma indicating likely nematode entry via:
  - Spiracles
  - Mouth
  - Genital operculum

- Nematodes were also observed attempting to penetrate
  - Intersegmental membranes
  - Exiting from the anus

Typical death posture